

WHAT IS CLAIMED IS:

- 1/16/18
- 5
- 10
- 15
- 20
- 25
1. A method for making a string binder comprising the steps of:
 - a) forming at least one strand of a fibrous carrier substrate;
 - b) preparing a catalyst composition comprising a catalytically effective amount of a catalyst having a high activation temperature;
 - c) applying at least one layer of a pre-coating comprising the catalyst composition to the surfaces of the fibrous carrier substrate;
 - d) applying at least one layer of a solvent-free binder resin composition comprising a thermoformable liquid binder resin material having an acid value of less than about 30 mg KOH/g of resin to the surfaces of the fibrous carrier substrate to form a coated fibrous carrier substrate; and
 - e) solidifying the coated fibrous carrier substrate to form a string binder.
 2. The method of claim 1, wherein the step of preparing the catalyst composition comprises combining a catalyst having a high activation temperature with at least one thermoplastic or thermosetting carrier material.
 3. The method of claim 2, wherein the carrier material is a thermoplastic resin.
 4. The method of claim 2, wherein the carrier material is a thermosetting resin.
 5. The method of claim 4, wherein the carrier material is a polyurethane.
 6. The method of claim 1, wherein the step of applying the at least one layer of pre-coating is followed by drying the fibrous carrier substrate coated with the catalyst composition in an air chamber before the binder resin composition is applied.
 7. The method of claim 6, wherein the air chamber is an oven.
 8. The method of claim 1, further comprising the step of chopping the string binder into segments.

9. A method for making a string binder comprising the steps of:

- a) forming at least one strand of a fibrous carrier substrate;
- b) applying at least one layer of a solvent-free binder resin composition comprising a thermoformable liquid binder resin material having an acid value of less than about 30 mg KOH/g of resin to the surfaces of the fibrous carrier substrate to form a coated fibrous carrier substrate;
- c) preparing a catalyst composition comprising a catalytically effective amount of a catalyst having a high activation temperature;
- d) applying at least one layer of a post-coating comprising the catalyst composition to the surfaces of the fibrous carrier substrate; and
- e) solidifying the coated fibrous carrier substrate to form a string binder.

10. The method of claim 9, wherein the step of preparing the catalyst composition comprises combining a catalyst having a high activation temperature with at least one thermoplastic or thermosetting carrier material.

11. The method of claim 10, wherein the carrier material is a thermoplastic resin.

12. The method of claim 10, wherein the carrier material is a thermosetting resin.

13. The method of claim 12, wherein the carrier material is a polyurethane.

14. The method of claim 9, wherein the step of applying the at least one layer of post-coating is followed by drying the coated fibrous carrier substrate in an air chamber.

15. The method of claim 14, wherein the air chamber is an oven.

16. The method of claim 9, further comprising the step of chopping the string binder into segments.

~~17. A string binder formed according to the process of claim 1.~~

~~18. A string binder formed according to the process of claim 9.~~

19. A process of making a preform comprising the steps of:

a) preparing a string binder by:

- i) forming at least one strand of a fibrous carrier substrate;
- ii) preparing a catalyst composition comprising a catalytically effective amount of a catalyst having a high activation temperature;
- iii) applying at least one layer of a coating comprising the catalyst composition to the surfaces of the fibrous carrier substrate;
- iv) applying at least one layer of a solvent-free binder resin composition comprising a thermoformable liquid binder resin material having an acid value of less than about 30 mg KOH/g of resin to the surfaces of the fibrous carrier substrate to form a coated fibrous carrier substrate; and
- v) solidifying the coated fibrous carrier substrate to form a string binder.

b) chopping the string binder into segments;

- c) depositing the segments onto the surface of a shaped, porous form;
- d) applying heat to partially melt and fuse the segments into a preform structure; and

e) curing the preform.

20. A process according to claim 19, wherein a vacuum is applied during the step of

applying heat to partially melt and fuse the segments into a preform structure.

21. A process according to claim 19, further including co-roving the string binder with one or more strands of a fibrous reinforcing material.

~~22. A preform manufactured according to the process of claim 19.~~

~~23. A molded composite article comprising a moldable matrix polymer material and the preform of claim 22.~~

24. The molded composite article of claim 23 wherein the moldable matrix polymer material is selected from the group consisting of vinyl esters, polyesters, and urethanes.

5 25. The molded composite article of claim 24, wherein the moldable matrix polymer material is a urethane.

sub A3 26. A multi-end roving comprising:

- a) one or more strands of a reinforcing fiber material; and
- b) one or more strands of a string binder prepared according to the method of claim 1.

10 27. The multi-end roving of claim 26, in the form of chopped segments.

28. The multi-end roving of claim 27, wherein the chopped segments are from about $\frac{1}{2}$ " to about 3" in length.

sub A4 29. A multi-end roving comprising:

- a) one or more strands of a reinforcing fiber material; and
- 15 b) one or more strands of a string binder prepared according to the method of claim 9.

30. The multi-end roving of claim 29, in the form of chopped segments.

31. The multi-end roving of claim 30, wherein the chopped segments are from about $\frac{1}{2}$ " to about 3" in length.